Ex 16 Lös ekvationen $27^x + 2 \cdot 3^x = 3 \cdot 9^x$.

$$27^x + 2 \cdot 3^x = 3 \cdot 9^x$$

$$\Leftrightarrow \quad (3^3)^x + 2 \cdot 3^x = 3(3^3)^x$$

$$\Leftrightarrow \quad (3^x)^3 + 2 \cdot 3^x = 3 \cdot (3^x)^2$$

Sätt $t = 3^x \quad (\Rightarrow t > 0)$

$$\Rightarrow \quad t^3 + 2t = 3t^2$$

$$\Leftrightarrow \quad t(t^2 - 3t + 2) = 0$$

$$\Leftrightarrow \quad t = 0 \quad \text{eller} \quad t^2 - 3t + 2 = 0$$

$$\Leftrightarrow \quad t = \frac{3}{2} \pm \sqrt{\frac{9}{4} - \frac{8}{4}} = \frac{3}{2} \pm \frac{1}{2}$$

$$\Leftrightarrow \quad t = 2 \quad \text{eller} \quad t = 1$$

$t = 3^x = 0 \qquad$ Saknar lsg!

$t = 3^x = 1 \quad \Leftrightarrow \quad x = 0$

$t = 3^x = 2 \quad \Leftrightarrow \quad \ln 3^x = x \ln 3 = \ln 2 \Leftrightarrow x = \dfrac{\ln 2}{\ln 3}$

Svar: $x = 0$ eller $x = \dfrac{\ln 2}{\ln 3}$.

Ex 17 Lös ekvationen $\ln(x-4) + \ln(x-3) = \ln 2$

$$\ln(x-4) + \ln(x-3) \overset{*}{=} \ln(x-4)(x-3) = \ln 2$$

$$\Leftrightarrow \quad e^{\ln(x-4)(x-3)} = e^{\ln 2}$$

$$\Leftrightarrow \quad (x-4)(x-3) = x^2 - 3x - 4x + 12 = x^2 - 7x + 12 = 2$$

$$\Leftrightarrow \quad x^2 - 7x + 10 = 0$$

$$\Leftrightarrow \quad x = \frac{7}{2} \pm \sqrt{\frac{49}{4} - \frac{40}{4}} = \frac{7}{2} \pm \frac{3}{2}$$

$$\Leftrightarrow \quad x = 5 \quad \text{eller} \quad \underline{x = 2} \qquad (x - 3 = 2 - 3 = -1 < 0)$$
$$\text{Falsk rot}$$

$*$ $\ln ab = \ln a + \ln b$ endast om $a > 0$ ah $b > 0$!

Svar: $x = 5$.